

April 19, 2007

MEMORANDUM TO: Gregory Suber, Acting Branch Chief  
Environmental Review Branch  
Division of Waste Management  
and Environmental Protection  
Office of Federal and State Materials  
and Environmental Management Programs

FROM: Johari Moore, Project Manager  
Environmental Review Branch  
Division of Waste Management  
and Environmental Protection  
Office of Federal and State Materials  
and Environmental Management Programs

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT FOR THE RENEWAL  
OF U.S. NUCLEAR REGULATORY COMMISSION LICENSE NO.  
SNM-1107 FOR WESTINGHOUSE COLUMBIA FUEL  
FABRICATION FACILITY

The Environmental Review Branch has completed preparation of the final environmental assessment (EA) regarding Westinghouse Columbia Fuel Fabrication Facility's request for License Renewal.

Please contact me with any questions regarding this EA.

Enclosure:  
Final Westinghouse CFFF EA

CONTACT: Johari Moore, DWMEP/FSME  
(301) 415-7694

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U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF FEDERAL AND STATE MATERIALS AND ENVIRONMENTAL  
MANAGEMENT PROGRAMS  
DIVISION OF WASTE MANAGEMENT AND ENVIRONMENTAL PROTECTION

ENVIRONMENTAL ASSESSMENT  
FOR THE RENEWAL OF U.S. NUCLEAR REGULATORY COMMISSION  
LICENSE NO. SNM-1107 FOR  
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY

DOCKET NO. 70-1151

April 2007

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#### ACRONYMS/ABBREVIATIONS

ADU	ammonium diuranate
ALARA	as low as reasonably achievable
AMSL	above mean sea level
CFFF	Columbia Fuel Fabrication Facility
EPA	U.S. Environmental Protection Agency
FONSI	Finding of No Significant Impact
HEPA	high-efficiency particulate air
MSA	metropolitan statistical area
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutant
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
VOC	volatile organic compound
WEC	Westinghouse Electric Company

ENVIRONMENTAL ASSESSMENT  
FOR THE RENEWAL OF U.S. NUCLEAR REGULATORY COMMISSION  
LICENSE NO. SNM-1107 FOR  
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY

## 1.0 INTRODUCTION

### 1.1 Background

By letter dated September 29, 2005 (WEC, 2005a), Westinghouse Electric Company (WEC) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew its Special Nuclear Materials License SNM-1107 for the Columbia Fuel Fabrication Facility (CFFF) located near Columbia, South Carolina. Under SNM-1107, WEC is authorized to receive and possess nuclear materials at the CFFF in order to fabricate and assemble nuclear fuel components under the provisions of 10 CFR Part 70, Domestic Licensing of Special Nuclear Material. WEC has conducted operations at the site since 1969 and is currently operating under a license that was last renewed in 1995 for a 10-year period. WEC filed the current renewal application more than 30 days prior to the license expiration date of November 30, 2005. In accordance with 10 CFR 70.38, the existing license will not expire until NRC makes a final determination on the renewal application. The current WEC request is for a 20-year license renewal.

This environmental assessment (EA) was prepared in accordance with NRC regulations in 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions; applicable NRC guidance from NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs (NRC, 2003); and other relevant National Environmental Policy Act (NEPA)-implementing regulations, including Council on Environmental Quality regulations (40 CFR Parts 1500-1508). NRC is also conducting a detailed safety review of the WEC request for license renewal; the results will be documented in a separate safety evaluation report.

WEC, as required by 10 CFR 51.60, submitted an Environmental Report (WEC, 2004) that served as a key reference in preparing this environmental assessment. The Environmental Assessment for Renewal of Westinghouse Electric Corporation License SNM-1107 (NRC, 1995), and the Application for Renewal of SNM-1107 (WEC, 2005b) were also utilized. Additional references are listed in the Section 8.0 of this environmental assessment.

In its 1995 environmental assessment (NRC, 1995), the NRC assessed the potential environmental impacts of a 10-year renewal of WEC's SNM-1107 license and concluded that these impacts would not be significant and did not warrant the preparation of an environmental impact statement (EIS). Though the core operations at CFFF have not changed since the 1995 EA, there have been amendments to the SNM-1107 license during this period that relate to operations at the facility. This EA provides an independent evaluation of current CFFF operations and an assessment of the potential impacts associated with a 20-year proposed license renewal. As documented below, the NRC now finds that no EIS is warranted, and that a finding of no significant impact (FONSI) is appropriate in accordance with 10 CFR 51.31.

## 1.2 Need for the Proposed Action

CFFF is one of several facilities that fabricates fuel assemblies for commercial light-water cooled nuclear reactors. Continued production of the fuel assemblies is needed to meet the anticipated steady or increasing demand for electricity generated by these nuclear power reactors. WEC plans to continue to be a major supplier of this type of fuel, by the CFFF remaining licensed by NRC.

## 1.3 The Proposed Action

### 1.3.1 Description of the Proposed Action

The Proposed Action is to renew the SNM-1107 license for a 20-year period, thereby authorizing WEC to continue manufacturing nuclear fuel at CFFF. The current license authorizes WEC to receive, possess, use, and transfer special nuclear material at the CFFF in accordance with the requirements of 10 CFR Part 70. The renewed license would provide the same continued authorization to WEC.

### 1.3.2 Description of Facility Activities

The CFFF site is in central South Carolina approximately 13 km [8 mi] southeast of the city of Columbia (Figure 1). The primary function of CFFF is to fabricate nuclear fuel assemblies containing low enriched uranium oxide fuel for use in commercial light-water cooled nuclear power reactors. CFFF also produces other fuel-related products such as control rods and mechanical components. The primary facilities consist of a main fuel fabrication plant, waste treatment facilities, holding ponds, raw material storage buildings, and office space.

The production of nuclear fuel assemblies performed in the main fuel fabrication plant involves the chemical conversion of the compound uranium hexafluoride into a uranium oxide by way of the ammonium diuranate (ADU) process, which uses water and ammonium hydroxide. The uranium oxide is granulated, mixed with a binder-lubricant, and pressed by a machine to form ceramic fuel pellets. These pellets are sintered or heated to create the appropriate density and processed through a grinder to create the appropriate dimensions. Then, the pellets are loaded and sealed into metal fuel rods. These rods are assembled into bundles that form the nuclear fuel assemblies. Completed assemblies are either stored onsite or immediately shipped in NRC-approved containers to customers for subsequent irradiation in commercial light-water cooled nuclear power reactors. Handling of the fuel assemblies at the NRC-licensed commercial reactors is governed by NRC regulation 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities and onsite inspection. Shipments of nuclear materials from CFFF are governed by NRC, the U.S. Department of Transportation, and State of South Carolina regulations. Various ancillary operations conducted at CFFF that support the ADU chemical conversion process and ceramic pellet fabrication, assembly, and distribution, include oxidation, dissolution, chemical precipitation, cylinder recertification, cylinder washing, respirator cleaning, incineration, solvent extraction, waste treatment, mechanical operations, welding, metal fabrication, quality control testing, and shipping container painting.

The nature of the CFFF operations creates the potential for release of NRC-licensed material into the air, water, and soil. CFFF conducts effluent and environmental monitoring to evaluate potential health and environmental impacts and monitors compliance with applicable federal and

## AREA SURROUNDING CFFF

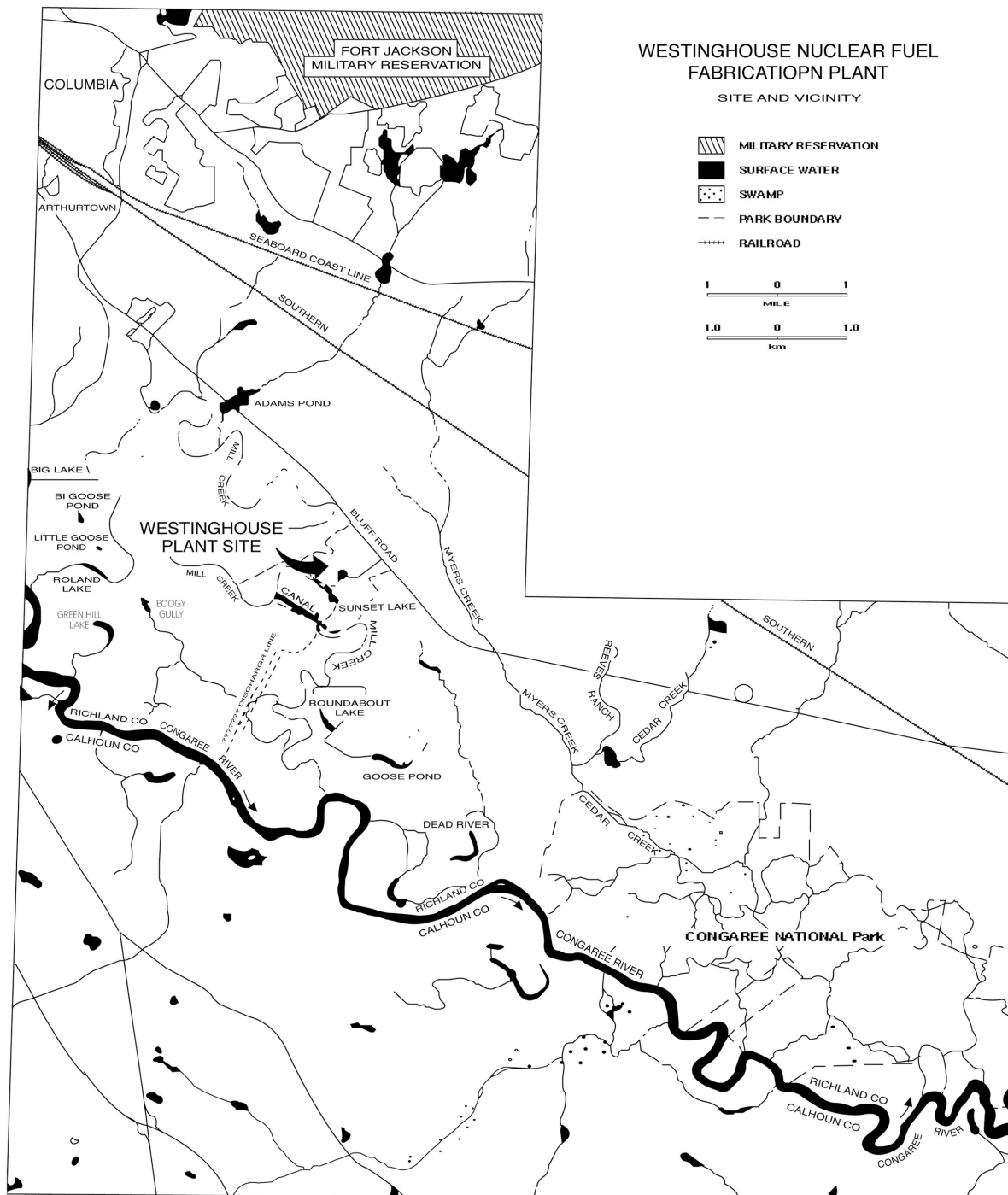


Figure 1. Geographical Location of CFFF (Modified From NRC, 1995)

state regulations. Gaseous, liquid, and solid effluents produced from NRC-licensed activities may contain radiological and/or nonradiological contaminants. Items monitored in the effluent streams include radiological material, such as uranium, and nonradiological materials, such as ammonia and hydrofluoric gas. CFFF has implemented a program designed to keep radiological exposures and effluent levels as low as reasonably achievable (ALARA). This program is implemented in the CFFF procedures to ensure that systems, processes, and facilities incorporate the ALARA concept. The CFFF change control program, as implemented under WEC procedures, provides a formal process to ensure potential environmental, health, and safety impacts from changes to facilities operations are evaluated. CFFF also operates a comprehensive environmental monitoring program that collects air, groundwater, surface water, sediment, soil, and vegetation samples and tests them for radiological content. This program is part of the NRC license requirements for the facility (License No. SNM-1107). Program details are described in Section 4.4 of this environmental assessment.

Gaseous effluents from the radioactive material operations are treated and sampled prior to release to the environment. High Efficiency Particulate Air (HEPA) filters and scrubbers are commonly used pollution control equipment employed at CFFF to treat gaseous effluents for both radiological and nonradiological constituents. Emissions from stacks that could release radioactive material are continuously sampled and analyzed daily for uranium levels. Gaseous effluents from the fabrication plant are also sampled and analyzed for ammonia and fluoride levels.

The CFFF activities produce several types of liquid effluent streams. The liquid process waste generated from the ADU fuel fabrication process contains radiological and nonradiological contaminants. This liquid effluent receives preliminary treatment within the main fuel fabrication plant to reduce the uranium levels using quarantine tanks and diversion tanks. This liquid effluent is pumped to the advanced waste water treatment facility for further treatment of uranium and initial treatment of nonradiological components, such as ammonium fluoride, that are formed during the ADU process. Liquid waste treatment at this facility consists of filtration, flocculation (aggregation), lime addition, distillation, and precipitation in a series of holding lagoons. Uranium levels are lowered by adding sodium silicate, a compound that reacts with the dissolved uranium to form a cake-like solid, which is removed from the liquid effluent. Lime is used to adjust the pH of the liquid effluent to recover the ammonia and remove the fluoride. The recycled ammonia is collected for reuse in the ADU process. The levels of radiological and nonradiological contaminants in the treated liquid effluent are tested prior to the consolidation with other waste streams.

Other liquid effluents in smaller quantities are generated within the main fuel fabrication plant. Some of these effluents are collected in quarantine tanks, sampled, and analyzed prior to discharge to the waste treatment facility. The remaining effluents from sources like the laboratory drains and controlled area sinks are collected, filtered, sampled, analyzed, and released to the waste treatment facility lift station.

The CFFF sanitary waste sewage is initially treated at the aeration package plant. It is chlorinated and then mixed with the treated liquid process waste and other various liquid waste at a lift station. This combined liquid effluent stream is passed through a final aerator, adjusted for pH, and dechlorinated. Prior to being pumped to and discharged into the Congaree River, the combined liquid effluent is sampled for regulatory compliance with both a South Carolina Department of Health and Environmental Control-issued National Pollutant Discharge

Elimination System (NPDES) permit for nonradiological contaminants and 10 CFR Part 20, Standards for Protection Against Radiation for radiological contaminants.

The CFFF operations produce a variety of low-level radioactive solid waste, which is sorted into one of two categories: combustible or noncombustible. Specially designed collection containers are located throughout the work area for each material category. After a determination that the sorting is correct, the waste is transferred to a waste processing station within the main fuel fabrication plant. Radiation surveys are conducted to determine whether any waste can be decontaminated for free release or re-used in accordance with applicable regulations and license provisions. The remaining material is identified for incineration onsite or disposal offsite at an NRC-approved and licensed low-level radioactive disposal facility such as the Barnwell site in South Carolina. In 2008, the company operating the Barnwell site may restrict disposal of low-level waste to states that are members of the Atlantic Low-Level Waste Compact; South Carolina is one of these member states and would continue to have access to disposal at the site beyond 2008 (Zacha, 2003). Nonhazardous solid wastes generated at CFFF are disposed of offsite at a state-permitted landfill.

### 1.3.3 Decommissioning

NRC will require WEC to decontaminate and decommission CFFF when license SNM-1107 is terminated. At that point, WEC will submit a detailed decommissioning plan to NRC that is consistent with applicable license termination criteria at the time of decommissioning. WEC has established a financial surety agreement in accordance with NRC regulation 10 CFR 70.25 to cover the costs of potential decontamination and decommissioning activities associated with license termination (WEC, 2005b).

## 2.0 ALTERNATIVES TO THE PROPOSED ACTION

### 2.1 No-Action Alternative

The No-Action Alternative is the licensee's ceased manufacturing of nuclear fuel at CFFF because of a denied license renewal. If NRC does not renew license SNM-1107, radiological operations at CFFF would cease and decommissioning activities would begin. In the short term, the potential environmental impacts from decommissioning would likely be similar to the impacts resulting from continued operations, with the anticipated addition of a relatively large increase in waste generation from building decontamination, demolition, and removal. Additionally, there would likely be socioeconomic impacts associated with facility decommissioning.

Demand for nuclear fuel may increase in the future. The nuclear industry anticipates proposals for the licensing and construction of several new nuclear power plants (Wald, 2006) in the near future. Fuel supplies would need to meet the demands of both existing and new power plants in the near future. Based on expected future demand for nuclear fuel, a CFFF shutdown would imply that production would be performed at another location, and the associated environmental impacts would shift to that location. If a new facility were built to meet the fuel demand, the environmental impacts would likely be greater than for an existing facility because of construction and start-up activities. Thus the environmental impacts of the No-Action Alternative may exceed those of the Proposed Action. The detailed environmental impact analyses for nuclear fuel production presented in this environmental assessment will be specific to the CFFF site.

## 2.2 Renewal for 10-Year Term

This environmental assessment is based on a 20-year license renewal period that WEC requested. An alternative to renew the license for a 10-year period was not examined in this environmental assessment because potential environmental impacts from a 20-year license renewal request would bound those of the 10-year license renewal alternative.

## 3.0 AFFECTED ENVIRONMENT

### 3.1 Site Description and Land Use

The CFFF site occupies a 469-ha [1,158-acre] area of semi-rural land in Richland County, South Carolina, approximately 13 km [8 mi] southeast of the city of Columbia. The various facilities only occupy approximately 24 ha [60 acres] or about 5 percent of the property area. The remaining 445 ha [1,100 acres] are undeveloped. The CFFF is bounded by state highway SC 48 to the north and private property owners in all other directions. The CFFF site lies within the flood basin of the Congaree River, which flows approximately 6.4 km [4 mi] southwest of the main plant. The land consists of timbered tracts and wetland areas penetrated by unimproved roads. Much of the land within the site boundary is designated agricultural. A variety of activities are conducted in the undeveloped portion of the site. These activities include management of the forested areas for timber production and harvesting of hay fields. Recreational facilities in the undeveloped portion of the site include a fitness trail, softball field, and a picnic pavilion for employee use. Employees are permitted to fish and hunt in designated areas on the CFFF property.

The land around the CFFF site (Figure 1) is used for a variety of purposes. Two schools are located within an 8-km [5-mi] radius of CFFF. South Carolina Electric and Gas is constructing a new commercial electrical substation on approximately 2.8 ha [7 acres] along the northwest border of CFFF property on land purchased from WEC. The new facility should improve reliability of electrical service to the CFFF and other customers in the vicinity and will not routinely be staffed with personnel. The land sale and right of way issuance was completed in 2005 and the electrical substation is scheduled to begin service in May 2007 (WEC, 2006a). Two public parks are near the CFFF site: Bluff Road Park is located approximately 5.6 km [3.5 mi] to the north, and Hopkins Park is approximately 4 km [2.5 mi] to the east. Located approximately 8 km [5 mi] southeast of CFFF is the Congaree National Park. Other facilities in the vicinity include the Richland County Detention Center (jail) located 8 km [5 mi] to the north. Two major military installations are located near CFFF: Fort Jackson military reservation approximately 11 km [7 mi] north, and McEntire Joint National Guard Station approximately 9.7 km [6 mi] northeast.

Columbia and the surrounding area contain a well-developed and maintained system of interstate, regional, and local highways that provide easy year-round access. Three interstate highways serve Columbia. The CFFF site can be accessed by state highway SC 48. Although CSX Transportation Inc. operates two rail lines close to the CFFF site, there are no rail lines or spurs on the property.

### 3.2 Demography and Socioeconomics

The CFFF site is located in Richland County. Lexington County is west of Richland County and is part of the greater Columbia Metropolitan Statistical Area (MSA); thus, both Richland and Lexington Counties will be addressed in this section. According to the 2000 Census, the state population was 4,012,012 with 320,677 residents in Richland County and 216,014 in Lexington County (U.S. Census Bureau, 2006). The 2000 Census populations were 15.1, 12.2, and 28.9 percent greater than the 1990 Census populations, respectively. Accordingly, based on the percentages, Lexington County experienced the largest growth rate during the decade. The total population of the two counties in 2000 was 13.4 percent of the state total. The estimated 2005 state and county populations were 4,255,083 (state), 340,078 (Richland), and 235,272 (Lexington) and indicate that the two counties made up 12.5 percent of the total state population.

The nearest population center to the CFFF site is Columbia, the state capital. In 2000, the census population of Columbia was 116,278; the estimated population in 2004 was 116,331 (essentially the same as in 2000) (U.S. Census Bureau, 2006). However, the population in the two counties increased by approximately 38,700 over the 5-year period from 2000 to 2005 (7.2-percent increase). Accordingly, the growth is primarily in smaller towns and rural areas.

The minority (non-white) population of the two-county area was 35.3 percent in the 2000 Census, compared to 29.5 percent for the state of South Carolina (U.S. Census Bureau, 2006). In Richland County, which includes the largest portion of the Columbia MSA, non-whites represented 49.0 percent of the population, while in the more rural Lexington County, the percentage was 15.0. In Columbia, based on the 2000 Census, non-whites made up just over half of the total population at 50.1 percent.

Based on the 2000 Census, the median household income in 1999 for the entire United States was \$41,994; 12.4 percent of the individuals nationwide were below the poverty level (U.S. Census Bureau, 2006). For South Carolina in 2000, the median household income was \$37,082 (88.3 percent of the median household income for the entire United States) and 14.1 percent of individuals have income below the poverty level. Comparable statistics from the 2000 Census for Richland County indicated a median household income of \$39,961 (7.8 percent higher than the state median of \$37,082; and 4.8 percent lower than the U.S. median). In Lexington County, the median household income was \$44,659 (20.4 percent higher than the state; and 6.3 percent higher than the U.S. median). 2000 Census data show 13.7 percent of individuals live below the poverty level in Richland County and a corresponding 9.0 percent in Lexington County. The percentage of individuals below the poverty level in Lexington County was well below state (14.1 percent) and national (12.4 percent) percentages for the same period. However, the percentage of individuals below the poverty level in Richland County was 1.3 percent above the national percentage and slightly lower (0.4 percent) than that of South Carolina.

In Columbia, the median household income in 1999 was \$31,141; this income level was 84.0 percent of the comparable state level and 74.1 percent of the level for the country (U.S. Census Bureau, 2006). The 2000 Census indicated that 22.1 percent of Columbia residents lived below the poverty level; this percentage is considerably higher than for the state (14.1 percent) and the country (12.4 percent).

For the Columbia MSA, the total civilian labor force (non-farm) in May 2006 was approximately 362,200 (South Carolina Employment Security Commission, 2006). Currently, approximately 1,200 people are employed at the CFFF site and future employment levels are not expected to vary much from that figure (WEC, 2006b). The May 2006 unemployment rate for South Carolina was 6.5 percent, down from an April rate of 6.6 percent. The comparable May 2006 unemployment rates for the Columbia MSA and Richland and Lexington Counties were 5.3, 5.6, and 4.4 percent, respectively. Accordingly, the unemployment rates in the vicinity of the CFFF site are currently lower (better) than the statewide average. Major employers in Richland County include Palmetto Health Alliance, Inc.; the University of South Carolina; the Richland School District; and the U.S. Department of Defense. Key employers in Lexington County include the school district; United Parcel Service; Columbia Farms, Inc.; and Michelin Tire Corporation.

### 3.3 Climatology, Meteorology, and Air Quality

Richland County experiences four distinct seasons. Precipitation in the area includes rain, snow, sleet, and sometimes hail. The average annual precipitation is 115 cm [45.3 in] (WEC, 2004), with the monthly rainfall rates ranging from 7.31 cm [2.88 in] in November to 14.1 cm [5.54 in] in July (WEC, 2004). Measurable snowfall (with little long-term accumulation) typically occurs one to three times per year between December and February. The maximum recorded snowfall over a 24-hour period in Richland County was 40.6 cm [16 in] in 1973 (WEC, 2004).

Winds are predominantly from the southwest throughout the year but also prevail from the northeast in autumn and part of the winter. Wind speeds range between 9.6 km/h [6 mph] and 16 km/h [10 mph] with an average of 11 km/h [7 mph] (WEC, 2004). Winds in excess of 90 km/h [56 mph] were recorded 37 times between 1950 and February 2004 (WEC, 2004).

Severe weather in Richland County is generally limited to thunderstorms occurring an average of 53 days per year, with 60 percent of these during June, July, and August (WEC, 2004). From 1950 to 2005, the average number of storm events classified by the National Oceanic and Atmospheric Administration (NOAA) as “thunderstorm and high-wind” was approximately four per year in Richland County (NOAA, 2006). The thunderstorm and high wind classification is reserved for more extreme storm events including severe thunderstorms and damaging winds or hail.

South Carolina averaged approximately 14 tornadoes per year between 1950 and 2005 (NOAA, 2006). Richland County experienced 30 tornadoes during that time (NOAA, 2006). The seven most severe Richland County tornadoes would be classified as “strong violent” with a Fujita Tornado Damage Scale rating of F2 (NOAA, 2006). Tornadoes with a rating on the Fujita Tornado Damage Scale between F2 and F5 are considered “strong violent” (Lott, et al., 2000). An increase in the Fujita Tornado Damage Scale number represents an increase in tornado severity. Hurricanes, which are common in the Atlantic Ocean and the Gulf of Mexico, decrease in intensity as they move inland and are often reclassified as tropical storms. From 1950 to 2005, no hurricanes occurred in Richland County (NOAA, 2006).

Air quality at CFFF is regulated for nonradiological and radiological emissions. Applicable air pollution control regulations include 40 CFR Part 50, National Primary and Secondary Ambient Air Quality Standards; 40 CFR Part 61, National Emission Standards for Hazardous Air

Pollutants; and 10 CFR Part 20, Standards for Protection Against Radiation.

The National Ambient Air Quality Standards (NAAQS) define the acceptable levels for six common nonradiological pollutants: nitrogen oxides, ozone, sulphur oxides, carbon monoxide, lead, and total suspended particles. Compliance is attained when pollutant concentration levels are lower than the established NAAQS standards. The pollutant concentration levels in Richland County are lower than the established NAAQS standards for all pollutants except ozone. Portions of Lexington and Richland Counties, including the area around CFFF, have exceeded the NAAQS ozone standard (WEC, 2006a). The U.S. Environmental Protection Agency (EPA) has deferred designating this area as nonattaining because the counties have successfully participated in the Early Action Compact. Areas that enter into an Early Action Compact agree to reduce ozone concentrations and meet NAAQS emission levels by December 31, 2007, which is a shorter time line than federally mandated in the Clean Air Act. EPA initiated the Early Action Compact in 2002 and periodically assesses whether counties can continue to participate in the program and delay reclassification. Areas the EPA drops from the program immediately receive the nonattainment designation. The EPA has made the final periodical assessment concerning the participation of the affected counties in the program. The area designation for Richland and Lexington Counties has been deferred until April 15, 2008 (EPA, 2006). If the area has attained the NAAQS standard by the December 31, 2007, deadline, EPA will designate the area as attainment. Otherwise, the area will be designated as nonattainment.

A General Conformity determination as described in 40 CFR Part 93, Determining Conformity of Federal Actions to State or Federal Implementation Plans, is not required for this proposed license renewal. A General Conformity determination is a Clean Air Act requirement that examines air emissions for actions that occur in nonattainment or maintenance (formerly nonattainment) areas. As stated in 40 CFR 93.153(c)(ii), the requirement to perform a General Conformity determination is not applicable to continuing and recurring activities, such as permit renewals, where the scope and operation of the proposed activities remain similar to current activities. The proposed license renewal does not involve substantial changes to the CFFF or its operations, so the NRC staff has determined that a General Conformity determination is not required for this proposed action.

The National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulates hazardous chemicals, which are usually associated with particular industrial sources or activities. Nonradiological emissions at CFFF are regulated by the South Carolina Department of Health and Environmental Control under permit number 1900-0050 (effective May 12, 2003) (WEC, 2006a). The CFFF permit addresses NAAQS pollutants, nitric acid, and opacity. The permit does not require monitoring. Instead, operating permit limits are based on process throughputs at rated capacities as outlined by the South Carolina Department of Health and Environmental Control in South Carolina Air Quality Control Regulation 61-62. Emission rates are calculated based on these throughputs. Details concerning the CFFF nonradiological gaseous emissions are presented in Section 3.9.

Radiological emissions are regulated by NRC under 10 CFR Part 20 and by the U.S. Environmental Protection Agency under 40 CFR Part 61. WEC monitors radiological airborne discharges from 48 stacks and calculates an offsite dose from the combined emissions. As part of the environmental monitoring program, WEC also monitors for the presence of radioactive material in ambient air at four onsite locations. Exposure calculations

from the CFFF radiological gaseous emissions are presented in Section 3.10.

### 3.4 Hydrology

The CFFF site is located in the Congaree River Basin which covers 1,780 km<sup>2</sup> [688 mi<sup>2</sup>] and seven watersheds. The watershed specific to CFFF is the Congaree River watershed which covers approximately 56,746 ha [140,217 acres]. Both surface water and groundwater are derived from precipitation within the region.

Water for CFFF operations is obtained from the Congaree River. Average monthly CFFF plant water use in 2004 was just under 15,100,000 L [4,000,000 gal], which is less than 1 percent of the total water usage in the watershed (WEC, 2006a). Treated liquid effluent from CFFF operations is pumped to and discharged into the Congaree River. This discharge is regulated for nonradioactive contaminants under the NPDES Permit No. SC0001848 and for radiological contaminants under 10 CFR Part 20.

#### 3.4.1 Surface Water

Various bodies of water are located in the vicinity of the CFFF site. The major surface water body in the area is the Congaree River, which is formed by the confluence of the Broad and Saluda rivers at Columbia approximately 13 km [8 mi] from the CFFF site. With a southeastern flow, the Congaree River is nearest to the site at a point approximately 6.4 km [4 mi] southwest of the main manufacturing facility. Sunset Lake consists of approximately 3.2 ha [8 acres] of open water and is located just south of the main manufacturing facility. The lake is fed by Mill Creek which is a tributary of the Congaree River. Mill Creek continues as an outflow from Sunset Lake to the west through a swamp area that discharges into the Congaree River 4 km [2.5 mi] downstream from the CFFF site. Surface runoff at the CFFF site flows into Mill Creek and ultimately into the Congaree River. Other bodies of water near CFFF include Adams Pond, approximately 4.8 km [3 mi] to the northwest; Goose Pond, approximately 4.8 km [3 mi] to the south, and Myers Creek, approximately 3.2 km [2 mi] to the east.

Congaree River flow depends on the inflows from the Broad and Saluda River basins. Broad River flow is regulated by the Parr Shoals Dam and Saluda River flow is regulated by the Lake Murry Dam. Operations at these two dams significantly affect the attenuation of flood water into the Congaree River. Flooding in the 24 ha [60 acres] developed area of the site is unlikely. Site elevations range from approximately 34.1 m [112 ft] above mean sea level (AMSL) to approximately 42.7 m [140 ft] AMSL (WEC, 2004). The developed portion of the site is located on a terrace with the highest site elevation. The main manufacturing building's floor is at 43.3 m [142 ft] AMSL. Much of the undeveloped portion of the property lies within the Mill Creek flood plain. The terrace and the flood plain are separated by a bluff approximately 6.1 m [20 ft] high located at the edge of the developed area. The potential for flooding is in the developed portion of the property and is minimized by this bluff.

The surface water within the Mill Creek flood plain is classified as a blackwater system characterized by naturally low pH and dissolved oxygen concentrations. Aquatic life and recreational uses are fully supported along the downstream portion of Mill Creek (WEC, 2004). Aquatic life is classified as fully supported if dissolved oxygen and pH values meet specified standards at least 90 percent of the time and recreational use is classified as fully supported if fecal coliform bacteria levels meet specified standards at least 90 percent of the time (South

Carolina Department of Health and Environmental Control, 2004).

### 3.4.2 Groundwater

The regional groundwater occurs in multiple aquifers, mostly under confined conditions. These aquifers are typically composed of one or more layers of permeable sands or limestone separated by impermeable layers of clay-rich materials. At the CFFF site, the average depth to the water table is approximately 4.6 m [15 ft] (WEC, 2004).

An EPA site screening investigation in 1989 identified volatile organic contamination in the groundwater at the CFFF site. In 1992, WEC conducted an investigation to further document the problem, and with input from South Carolina Department of Health and Environmental Control, developed a work plan to study the contaminated area. This study indicated that the plume consisted of perchlorethylene, trichlorethylene, and their degradation products. Further studies reported that the contamination originated from leaking drums temporarily stored outside the old oil house. The plume extended approximately 305 m [1,000 ft] southwest toward Sunset Lake (WEC, 2006a). A remedial design plan was developed and submitted to the state of South Carolina for review and approval. WEC voluntarily installed a groundwater remediation system in 1998 to prevent contamination from reaching deeper aquifers and surface waters such as Sunset Lake. This remediation system consists of air sparging (introducing air below the water table to promote volatilization and biodegradation) and soil vapor extraction (creating a negative pressure above the plume to expedite volatilization of compounds). Prior to remediation, well sampling from 1995 to 1998 indicated groundwater volatile organic compound (VOC) levels from 0–3,000 µg/L (WEC, 2005c). The highest VOC level reported in 2004 was 569 µg/L (WEC, 2005c). Groundwater samples are taken twice a year from monitoring wells distributed across the site as specified in NPDES Permit SC0001848. The samples are analyzed for pH, fluoride, ammonia, nitrate, and radiological components. WEC has continued the remedial action to attenuate the VOC levels and mitigate plume migration.

Groundwater samples from the site are collected quarterly and analyzed for radiological components. Analyses results indicate small radiological impact to groundwater from CFFF operations (WEC, 2004). In 1998, radiological sample results from three wells exceeded the gross beta investigation limit (WEC, 2006a). In response, WEC implemented corrective actions to the CFFF operations and facilities that eliminated the source causing the elevated gross beta levels.

### 3.4.3 Wetlands

The Clean Water Act gives the U.S. Army Corps of Engineers jurisdiction to protect and regulate wetlands that are classified as “waters of the United States.” As depicted on the Department of the Interior Wetland Inventory Map (U.S. Fish and Wildlife Service, 2006a), 18 wetland areas are located on the CFFF property. Fourteen of these are located within the 100-year flood plain and would be considered jurisdictional by the U.S. Army Corps of Engineers and subject to protection under Section 404 of the Clean Water Act (U.S. Fish and Wildlife Service, 2006a). The 14 jurisdictional wetlands were identified as follows:

- Five palustrine, forested, broadleaf deciduous, scrub-shrub and/or needle leaved, and temporarily flooded and/or semi-permanently flooded wetlands located adjacent to Mill Creek on the southern portions of the site

- One palustrine, unconsolidated bottom semi-permanently flooded, excavated wetland (Sunset Lake)
- One palustrine, unconsolidated bottom semi-permanently flooded, excavated wetland (this appears as a drainage feature, is located on the western portion of the property, and drains into Mill Creek)
- Six herbaceous wetland areas as palustrine emergent, persistent, seasonally flooded, and/or semi-permanently flooded
- One palustrine, scrub/shrub broadleaf, seasonally flooded wetland

The remaining four wetlands were not in the 100-year flood plain and therefore would not fall under the jurisdiction of the Army Corps of Engineers. These were all identified as palustrine emergent, persistent, seasonally flooded, and semi-permanently flooded wetlands.

### 3.5 Geology and Seismology

The CFFF site is located in the upper Coastal Plain physiographic province of the southeastern United States, near the boundary with the Piedmont province. The CFFF site is situated on approximately 73.2 m [240 ft] of undeformed and unconsolidated post-Triassic Coastal Plain sediments. These sediments, described in Table 1, overlie a complex of Paleozoic metamorphic crystalline rock, characterized by metamorphic gneisses and schists with some granite intrusions (WEC, 2004).

CFFF activities have affected soil quality. Soil around the area known as the old oil house has been contaminated with VOCs from past solvent spills. This area was sampled and analyzed for these nonradiological organic compounds. The highest level of total VOCs detected in any of the samples was 4.5 parts per million (WEC, 2006a). The South Carolina Department of Health and Environmental Control determined that this level of contamination would not require any removal or excavation of soil. A program was implemented to manage the groundwater in the aquifer beneath the soil. The groundwater monitoring and remediation associated with this volatile organic contamination is described in Section 3.4.2.

<b>Table 1. Description of the Coastal Plain Sediments at the Columbia Fuel Fabrication Facility Site*</b>			
<b>Formation Name</b>	<b>Age</b>	<b>Thickness</b>	<b>Description</b>
Okefenokee	Plio-Pleistocene	~6.1–12.2 m [20–40 ft]	Stratified, but poorly sorted mixture of clay, silt, sand, and gravel
Black Mingo	Paleocene to Eocene	~22.9 m [75 ft]	Upper clay unit and lower sand unit
Tuscaloosa	Late Cretaceous	~38.1–44.2 m [125–145 ft]	Multicolored clay interbedded with fine to coarse grade sand
*Westinghouse Electric Company. “Environmental Report for SNM 1107/70-1151—Update.” Columbia, South Carolina: Westinghouse Electric Company. 2004.			

The CFFF site region is not located near an active tectonic margin. The nearest major seismic source is the Charleston seismic zone, located approximately 145 km [90 mi] southeast of the CFFF site (WEC, 2004). Thus, seismicity in the area is characterized by small-magnitude background earthquakes and very infrequent moderate-to-large intra-continental earthquakes (NRC, 2005). The U.S. Geological Survey catalog (U.S. Geological Survey, 2006) reported 69 earthquakes have occurred within a 200-km [120-mi] radius of the CFFF site since 1973; ranging in magnitude from 1.1 to 4.9 on the Richter scale. The largest of these earthquakes occurred in 1974 and was located 144 km [89.5 mi] from the CFFF site. The Richter scale measures earthquake magnitude; an increase in the Richter scale number represents a greater magnitude. The scale is logarithmic, which means an increase of 1 unit on the scale represents a 10-times increase in magnitude. One of the largest known intra-continental earthquakes in

North American history was the 1886 Charleston earthquake, located approximately 145 km [90 mi] southeast of Columbia (NRC, 2005). The magnitude of this earthquake in Charleston was estimated as greater than 7.0 on the Richter scale. This earthquake’s intensity was estimated at the maximum value of X on the Modified Mercalli scale in Charleston and between VII and VIII in Columbia (WEC, 2004). The Modified Mercalli Intensity scale indicates the shaking severity of an earthquake; an increase in the Modified Mercalli Intensity number represents an increase in earthquake severity. The site has a 10-percent probability of exceeding a peak-ground acceleration of approximately 0.1 g (the force of gravity) and a 2-percent chance of exceeding a peak-ground acceleration of approximately 0.3 g in a 50-year period (U.S. Geological Survey, 2002).

### 3.6 Ecology

#### 3.6.1 Terrestrial

The Richland County area is located within the Southeastern Mixed Forest ecoregion; dominated by oak-hickory forests with the understory communities consisting of small tree species such as dogwood (*Cornus* spp.), red bud (*Cercis canadensis*), cedar (*Juniperus* spp.), and American holly (*Ilex opaca*). Common shrub species found within the understory include

blackberry (*Rubus* spp.), sumac (*Rhus* spp.), honeysuckle (*Lonicera* spp.), and poison ivy (*Toxicodendron radicans*) (World Wildlife Organization, 2006).

The undeveloped portions of the CFFF property are composed of open field dominated by grasses, forbs, and successional hardwood forests. Climax woodland areas are located along Mill Creek and east of the property boundary.

Located approximately 8 km [5 mi] southeast of CFFF is the Congaree National Park. Initially designated as the Congaree Swamp National Monument in 1976, the U.S. National Park Service designated the 9,000-ha [22,200-acre] area as a national park in 2003. The park is widely acknowledged to be one of the best examples of Southern bottomland hardwood ecosystem remaining in the world. Its wetlands provide a habitat for a diverse population of flora and fauna. The park is designated as an International Biosphere, a Globally Important Bird Area, and a National Natural Landmark (WEC, 2004).

According to the National Park Service (2006), there are approximately 294 species known or likely to occur within the park, including more than 34 mammal species, 32 reptile species, 29 amphibian species, 109 invertebrate species, and approximately 90 bird species. The Congaree National Park contains approximately 90 tree species with many holding state record sizes.

### 3.6.2 Aquatic

There are approximately 40 species of fish that are known or likely to live within the Congaree River System. The southern portion of CFFF lies within the flood plain of Mill Creek, a tributary to the Congaree River. Fish common to the area include large mouth bass, bluegill, catfish, and shiners (National Park Service, 2006).

### 3.6.3 Threatened and Endangered Species

Two federal-listed animal species have the potential to be found within Richland County: the Bald eagle (*Haliaeetus leucocephalus*) and the Red-cockaded woodpecker (*Picoides borealis*) (South Carolina Department of Natural Resources, 2006; U.S. Fish and Wildlife Service, 2006b). In addition, two state-listed animal species have the potential to occur within Richland County: the Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and the Pine Barrens treefrog (*Hyla andersonii*) (South Carolina Department of Natural Resources, 2006).

In addition to animal species, three federal- and state-listed plants are located within Richland County: the smooth coneflower (*Echinacea laevigata*), the rough-leaved loosestrife (*Lysimachia carolina*), and Canby's dropwort (*Oxypolis canbyi*) (South Carolina Department of Natural Resources, 2006).

## 3.7 Historical and Cultural Resources

The CFFF site is located near the Congaree River basin. Prehistoric inhabitants and historic Indian groups exploited the Congaree River region's diverse plant and animal resources. The Congaree Indians were a small tribe that farmed and built houses along the banks of the Congaree River next to other small Indian groups (Waddell, 2000; National Park Service, 2006). In 1545, Spanish explorer Hernando De Soto provided an early account of the local inhabitants and natural setting of the region (Clayton, et al., 1993). Contact with early European explorers

such as De Soto resulted in the decimation of Indian groups through exposure to diseases. By 1700, the number of Congaree Indians was greatly reduced by smallpox and persistent tribal feuding. Eventually the few remaining Congaree were assimilated into the Catawba tribe. (Sheppard, 2006; Waddell, 2006)

A search of the National Register of Historic Places database confirmed 11 prehistoric and historic sites located within an 8-km [5-mi] radius of the CFFF site (National Register of Historic Places, 2006a,b). None of these sites are located on the CFFF property. Six prehistoric mound sites are located on bluffs along the Congaree River in the Congaree Swamp National Park, and five historic sites are located near the town of Hopkins, South Carolina:

- Barber House, 1890s single dwelling, off State Highway S.C. 37, Hopkins vicinity
- Bridge Abutments, Address Restricted, Hopkins vicinity
- Dead River Dike, Address Restricted, Hopkins vicinity
- Northwest Boundary Dike, Address Restricted, Hopkins vicinity
- Southwest Boundary Dike, Address Restricted, Hopkins vicinity

The South Carolina Department of Archives and History considers five other sites, located within 8 km [5 mi] of CFFF, to have historical significance (WEC, 2004):

- Raiford's Mill Creek (Mill Creek)
- Cabin Branch (John Hopkins, Jr. Plantation House)—circa 1786 dwelling
- Clayton House—1887 dwelling
- Chappell Cabin Branch (Hicks Plantation House and Garden)—1781 dwelling
- Hopkins Overseers' Dwellings—19<sup>th</sup> century dwelling

During the recent land sale associated with the South Carolina Electric and Gas substation (see Section 3.1), an onsite historic cemetery was identified on an undeveloped portion of CFFF property. According to the South Carolina Department of Archives and History, the cemetery is the Denley Cemetery, which operated from approximately 1900 to 1940 (WEC, 2006b). The cemetery contains approximately 85 graves in an area approximately 2,700 m<sup>2</sup> [29,000 ft<sup>2</sup>]. In 2005 the area was fenced off, the shrubs were removed, the existing stones were maintained, and a list of known decedents was compiled. Section 5 of this environmental assessment describes the NRC's consultations with appropriate State and Tribal groups regarding historical and cultural resources.

### 3.8 Noise

Noise from CFFF is not detectable at the site boundary (WEC, 2006c). The distance from the facility to the site boundary {0.5 km [0.3 mi]} helps mitigate offsite noise impacts.

### 3.9 Waste Management

The CFFF operations produce airborne, liquid, and solid effluents. Airborne effluents are normally treated by HEPA filters, scrubbers, or both prior to release through stacks in accordance with 40 CFR Parts 50 and 61, and 10 CFR Part 20. The CFFF is classified as a minor-source operator, and the South Carolina Department of Environmental Health and Control does not require WEC to directly monitor for nonradiological pollutants. Instead, WEC provides

modeled emissions rates that the Department of Environmental Health and Control uses to determine compliance. Table 2 contains the modeled emission rates for various CFFF nonradiological gaseous pollutants. Emission rates are calculated based on process throughputs expressed in hours of operation. Typically, the Department of Environmental Health and Control performs compliance calculations for minor-source operators when permits are renewed or facilities are new or undergo major changes. Table 3 contains the modeled concentrations for various CFFF nonradiological gaseous pollutants. All pollutant concentrations were below regulatory limits. The only pollutant with concentrations greater than 18 percent of the limit was sulfur dioxide. The sulfur dioxide concentration ranged between 25 and 68 percent of the limit depending on the averaging time used for the calculation. Exposure calculations from the CFFF radiological gaseous emissions are presented in Section 3.10.

Liquid effluents are treated and discharged into the Congaree River in accordance with the NPDES permit and 10 CFR Part 20 requirements. On a typical day, CFFF discharges 492,000 L [130,000 gal] of liquid effluent into the Congaree River (WEC, 2004). Nonradiological parameters analyzed for NPDES compliance include pH, fluoride, ammonia, dissolved oxygen, biochemical oxygen demand, total suspended solids, phosphorus, fecal coliform, and chlorine.

From 2000 to 2005, the only parameter to exceed NPDES limits was biochemical oxygen demand (WEC, 2006a, 2004). During that time, the daily maximum threshold was exceeded three times and the monthly average threshold was exceeded four times. The largest of these temporary exceedances occurred on September 19, 2002, when the biochemical oxygen demand was nearly twice the daily maximum threshold (WEC, 2004). Exposure calculations from the CFFF radiological liquid effluents are presented in Section 3.10. Storm water runoff is regulated by the South Carolina Department of Health and Environmental Control under a general NPDES permit for Storm Water Discharges Associated with Industrial Activity (Permit Number SCR0000000). As required by this permit, WEC developed a Storm Water Pollution Prevention Plan.

The CFFF operations produce low-level radioactive solid waste. As described in Section 1.3.2, the material is either decontaminated for free release or reuse, incinerated onsite, or shipped offsite for disposal. From 1996 to 2003, the annual amount of low-level radioactive waste shipped offsite varied between 79 m<sup>3</sup> [2,789 ft<sup>3</sup>] and 5,132 m<sup>3</sup> [181,256 ft<sup>3</sup>] (WEC, 2004).

Hazardous wastes such as degreasing solvents, lubricating and cutting oils, and spent plating solutions are generated at CFFF. These wastes are regulated under 40 CFR Part 261, Identification and Listing of Hazardous Waste; 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste; and South Carolina Hazardous Waste Regulations R61–79.261. Hazardous Waste Generation Reports are provided quarterly and the waste is disposed of offsite through permitted contractors. The annual CFFF hazardous waste generation rate is approximately 18,100 kg [40,000 lb] (WEC, 2006a).

Nonhazardous waste is generated from routine office and industrial activities and is disposed of locally at an offsite state-permitted landfill. The annual CFFF generation rate for this type of waste is approximately 550 metric tons [610 tons] (WEC, 2006a).

No waste is disposed onsite. Also, no mixed waste (radiological and hazardous waste) is present or generated onsite.

<b>Table 2. Modeled Emission Rates for Various Columbia Fuel Fabrication Facility Nonradiological Gaseous Pollutants*</b>	
<b>Pollutant</b>	<b>Emission Rate</b>
Particulate Matter (>10 µm)	0.35 kg/hr [0.77 lb/hr]
Sulfur Dioxide	8.9 kg/hr [20 lb/hr]
Nitrogen Oxides	0.47 kg/hr [1.0 lb/hr]
Carbon Monoxide	2.6 kg/hr [5.7 lb/hr]
Nitric Acid	0.35 kg/hr [0.77 lb/hr]
*Westinghouse Electric Company. "RAI Responses For Westinghouse Columbia Fuel Fabrication Facility License Renewal Environmental Assessment." Columbia, South Carolina: Westinghouse Electric Company. 2006.	

<b>Table 3. Maximum Modeled Concentrations for Various Columbia Fuel Fabrication Facility Nonradiological Gaseous Pollutants*</b>			
<b>Pollutant</b>	<b>Averaging Time</b>	<b>Maximum Modeled Concentration (µg/m<sup>3</sup>)†</b>	<b>Standard (µg/m<sup>3</sup>)†</b>
SO <sub>2</sub>	3 hours	724.93	1,300
	24 hours	248.55	365
	Annual	20.082	80
PM <sub>10</sub>	24 hours	18.04	150
NO <sub>2</sub>	Annual	18.06	100
CO	1 hour	202.28	40,000
	8 hours	151.85	10,000
Nitric Acid	—	0.5	125
*Information based on April 28, 2003, update of August 7, 1995, modeling. Turner, D.R. "Task Order 8: Technical Assistance for the Development of an Environmental Assessment for the Westinghouse Electric Company (WEC) License Renewal Application." Letter (November 10) to J. Moore, NRC. ML063210205. San Antonio, Texas: Center for Nuclear Waste Regulatory Analyses. 2006. †Multiply µg/m <sup>3</sup> value by 2.7 × 10 <sup>-8</sup> to convert units to oz/yd <sup>3</sup> .			

### 3.10 Public and Occupational Health

The continued handling of materials and conduct of operations at CFFF pose potential impacts to public and occupational health. For normal operations, the potential impacts are related to the release of low levels of toxic or radioactive materials to the environment over extended periods of time. For accident conditions, the hazard may involve releasing higher concentrations of materials over relatively short periods of time.

### 3.10.1 Background Radiological Characteristics

For a U.S. resident, the average total effective dose equivalent from natural background radiation sources is approximately 3 mSv/yr [300 mrem/yr] but varies by location and elevation (National Council of Radiation Protection & Measurements, 1987). The source of this dose includes cosmic radiation, radionuclides generated by interactions between the atmosphere and cosmic radiation, radiation sources in the earth, radionuclides in the air, and radionuclides that exist in the body. In addition, the average American receives 0.6 mSv/yr [60 mrem/yr] from man-made sources including medical diagnostic tests and consumer products (National Council of Radiation Protection & Measurements, 1987). Because of its low elevation, relatively low radon levels, and relatively low concentration of radionuclides in the earth, the natural background radiation level in the vicinity of the CFFF site is 1.17 mSv/yr [117 mrem/yr] (WEC, 2004).

### 3.10.2 Public Health and Safety

Potential public health impacts could occur if large amounts of contaminants released from CFFF enter the environment and are transported from the site through the air, surface water, or groundwater. The potential contaminants include uranium, ammonia, calcium fluoride, and hydrofluoric acid. An effluent monitoring program is in place at the facility to ensure that potential releases to the environment are within federal and state regulations and are maintained ALARA (WEC, 2005c).

Radioactive uranium may be transported through the environment in a variety of ways and the public may be exposed from both internal and external pathways. Potential releases to the air may cause internal exposures directly through inhalation or indirectly through ingestion of crops and animal products that come in contact with radioactive material in the air. External exposures can occur directly from the radioactive plume or from particles from the plume deposited on the ground and other surfaces. Potential liquid releases to surface water or groundwater might lead to internal exposures through drinking water or eating irrigated crops. External and/or internal exposures may also occur from recreational activities, including boating and swimming in affected surface waters.

Calculated radiological doses to the public from the CFFF operations are primarily from the air emissions. Over 99 percent of the offsite dose originates from the airborne pathway (WEC, 2006a). Typical cumulative CFFF stack emissions would result in a total effective dose of less than  $4 \times 10^{-3}$  mSv [0.4 mrem] to a hypothetical exposed individual living at the site boundary (WEC, 2004). For the 6-year period from 2000 to 2005, this annual dose ranged between  $3 \times 10^{-3}$  mSv [0.30 mrem] and  $3.8 \times 10^{-3}$  mSv [0.38 mrem]. This is approximately 4 percent of the 0.1 mSv [10 mrem] annual dose limit from air emissions imposed by 10 CFR 20.1101. In contrast, the annual radiological total effective dose from liquid effluents is only  $3 \times 10^{-6}$  mSv [ $3 \times 10^{-4}$  mrem] (WEC, 2006c). The annual total effective dose from the combined effluent releases for the nearest actual resident to the licensed operations is approximately  $3 \times 10^{-4}$  mSv [ $3 \times 10^{-2}$  mrem] (WEC, 2005c). This is approximately 0.03 percent of the 1.0 mSv [100 mrem] annual dose limit from all pathways imposed by 10 CFR 20.1301. NRC is performing a safety review of CFFF (documented in a separate safety evaluation report) that will include detailed radiation safety analyses.

### 3.10.3 Occupational Health and Safety

Risks to occupational health and safety include exposure to industrial hazards, hazardous materials, and radioactive materials. Industrial hazards for CFFF are typical for similar industrial facilities and include exposure to chemicals and accidents ranging from minor cuts to industrial machinery accidents. No serious injuries or deaths have occurred at the CFFF site since operations began in 1969. For 2005, the CFFF Occupational Safety and Health Administration (OSHA) Total Recordable Incident Rate was 1.167 (WEC, 2006c). The incident rate accounts for both the number of OSHA recordable injuries and illnesses and the total number of man-hours worked. The incident rate is used for measuring and comparing work injuries, illnesses, and accidents within and between industries. The average incident rate for manufacturing facilities like WEC is 6.5 (U.S. Department of Labor, Bureau of Labor Statistics, 2004).

The CFFF workers are exposed to nonradiological materials that pose a potential hazard through chronic exposure or improper handling. The CFFF operations use a variety of hazardous and toxic chemicals including ammonia, nitric acid, nitrates, and hydrofluoric acid. Other hazardous materials include degreasing solvents, miscellaneous lubricating and cutting oils, and spent plating solutions. The CFFF Chemical Safety Program is designed to assure that all current and proposed chemical-use hazards are evaluated, and appropriate measures are taken to assure safe operations.

Workers are monitored for radiation exposure. For the 4-year period from 2001 to 2004, the average annual total effective dose to the occupational worker from the combined effluent releases ranged between  $3.37 \times 10^{-3}$  Sv [0.337 rem] and  $3.94 \times 10^{-3}$  Sv [0.394 rem] (WEC, 2006a). These doses are less than 10 percent of the  $5 \times 10^{-2}$  Sv [5 rem] annual occupational dose limit imposed by 10 CFR 20.1201. During that same time period, no individual radiation worker had an annual total effective dose above this limit (WEC, 2006a).

## 4.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

The Proposed Action is to renew WEC's license to operate the CFFF facility. Activity level for operations can change over time, resulting in fluctuations of effluent amounts. However, the evaluation of the environmental impacts of this license renewal is based on the impacts of past and current operations. For the No-Action Alternative in this environmental assessment, the short term will be defined as the decommissioning phase and the long term will be defined as the postdecommissioning phase. Short-term impacts for the No-Action Alternative would result from closing the facility and from decommissioning activities associated with license termination. The long-term impacts for the No-Action Alternative would depend on the license termination approach chosen by WEC and approved by NRC. This approach would dictate whether the land is released for restricted or unrestricted use based on the level of decontamination achieved. Options for postlicense termination use of the site, which will determine the long-term impacts of the No-Action Alternative, would be limited by whether the site is released for restricted or unrestricted use.

### 4.1 Nonradiological Impacts

No significant impact on land use is anticipated with the Proposed Action. CFFF already exists and no additional land use is associated with this license renewal. The No-Action Alternative

would have an impact on land use. In the short term, areas for equipment, waste, and decontamination would be needed to support decommissioning activities. The long-term impacts would depend on the level of decontamination achieved, which in turn would depend on whether the site was released for restricted or unrestricted use. This decision would provide the basis for a decommissioning plan that WEC would submit to NRC for review and approval.

No significant impacts to transportation are anticipated with the Proposed Action. Adequate access to the site already exists. No infrastructure expansion would be required to handle increased traffic levels from a new source. The No-Action Alternative would have a short-term impact on transportation. Decommissioning activities would result in an increase in the amount of material shipped offsite.

As a result of both employment levels at CFFF since the late 1960s, and other direct expenditures by WEC over the same period, positive economic impacts have been experienced in the Columbia MSA and other local towns and communities for over 35 years. The current CFFF employment level of approximately 1,000 persons is expected to continue over the license renewal period along with other direct expenditures. Thus, modest positive economic influences would be expected to continue. The employment level of 1,000 persons represents approximately 0.28 percent of the May 2006 total civilian labor force (non-farmer) in the Columbia MSA (South Carolina Employment Security Commission, 2006). The available housing units in the area are currently adequate and should continue to be adequate over the license renewal period. The No-Action Alternative would lead to closure of the facility and the elimination of the CFFF jobs. Many of the CFFF work requirements are specialized, and it is unlikely that a comparable number of similar positions could be found in the local economy. Resultant decommissioning activities at CFFF would likely provide some reduced level of employment for a period of time. However, this work force would no longer be needed when decommissioning was completed.

No significant impacts to air quality from nonradiological contaminants is anticipated with the Proposed Action. The No-Action Alternative could result in short-term impacts on air quality. Decommissioning activities could increase emissions, especially for particulate matter from activities such as building demolition and surface regrading.

No significant impacts to water supply or quality is anticipated if the Proposed Action is taken. Potential surface water impacts associated with operations at the CFFF site include the degradation of water quality in the Congaree River due to contaminated effluent discharges. This potential impact is minimized by compliance with the discharge limits outlined in the NPDES permit. Current effluent quality characteristics are well within the permit limitations. Potential groundwater impacts include the degradation of groundwater quality due to contamination caused by leaks or spills of material into the soil. This potential impact is minimized by implementation of the CFFF Chemical Safety Program and other procedures designed to ensure safe storage and handling of materials. Remediation is currently underway to address past groundwater contamination with VOCs, but continued operations at the CFFF site should not result in additional negative impacts on the local groundwater system. In addition, groundwater monitoring wells are being sampled for various water quality parameters as specified in the NPDES permit. No significant impacts from flooding are anticipated because of the Proposed Action. No significant impacts to wetlands are anticipated due to the Proposed Action because no filling, clearing, or other activities to identified jurisdictional wetlands or "Waters of the U.S." are expected as a result of the continued operation of CFFF. The

No-Action Alternative could result in water quality impacts. In the short term, decommissioning activities could result in increased effluent discharges from runoff. The long-term impact would depend on the level of decontamination achieved, which in turn would depend on whether the site was released for restricted or unrestricted use. The No-Action Alternative could increase the potential for flooding of the entire site if the integrity of the bluff becomes undermined by decommissioning activities and subsequent land use changes.

The site geology and soils are not expected to be significantly impacted by the Proposed Action. Currently, no impacts such as erosion, landslides, or subsidence have been observed. The No-Action Alternative may have a short-term impact on the site surficial geology (erosion) due to decommissioning activities.

No significant impacts to site ecology are anticipated because of the Proposed Action. Significant impacts to federal or state-listed threatened or endangered species and other flora and fauna in the site vicinity are unlikely. The No-Action Alternative could have short-term ecological impacts from decommissioning activities on other affected environmental areas such as noise, air quality, and land use. However, these impacts would not be expected to be much greater than the impacts from current operations.

No significant impacts to regional historic and cultural resources are anticipated because of the Proposed Action. The license renewal request does not propose action in undeveloped portions of the site. WEC indicated that the Environmental Protection Guidelines & Checklist used in evaluating configuration management changes to CFFF would be modified to incorporate provisions for protection or mitigation of archeological and historical resources in the event of a future discovery on site (WEC, 2006b). The short-term impacts for the No-Action Alternative would be similar to those expected with the Proposed Action. Additionally, decommissioning activities could expand into areas not previously disturbed that may contain archaeological resources.

No significant impacts from noise levels are anticipated because of the Proposed Action. The No-Action Alternative would likely create a short-term increase in noise levels if the decommissioning included the demolition of facilities.

No significant impacts from nonradiological waste management are anticipated because of the Proposed Action. Waste would be generated, handled, stored, and disposed of in accordance with current licensed procedures. Implementation of the CFFF Chemical Safety Program and other procedures are designed to minimize potential impacts from storing and handling waste. No solid wastes are disposed of onsite. Treated gaseous and liquid effluents are monitored for compliance with appropriate regulations prior to release into the local environment. The No-Action Alternative would result in a short-term impact. Decommissioning activities would increase the amount of waste generated, especially if facility demolition was performed.

No significant nonradiological impacts are anticipated to public and occupational health with this proposed license renewal.

## 4.2 Radiological Impacts

### 4.2.1 Normal Operations

No significant impacts to air quality from radiological contaminants are anticipated because of the Proposed Action. The types of emissions would remain the same with some possible fluctuations in quantities over time. The CFFF radiological gaseous emissions are within the 10 CFR Part 20 limits. The No-Action Alternative could result in short-term impacts on air quality. Associated decommissioning activities could result in increased emission quantities.

No significant impacts on water quality are anticipated because of the Proposed Action. Release of radioactive material into surface water and groundwater can have a negative effect on water quality. However, the levels of radioactive material in the discharged liquid effluent from CFFF are monitored and have historically remained below 10 CFR Part 20 limits. Groundwater monitoring for radiological components has indicated that the CFFF operations have had minimal impact. The No-Action Alternative could also produce some impacts to regional water quality. In the short term, decommissioning activities could result in increased effluent discharges. The long-term impacts would depend on the level of decontamination achieved, which in turn would depend on whether the site was released for restricted or unrestricted use.

No significant environmental impacts from radiological waste management are anticipated because of the Proposed Action. Radioactive waste would continue to be managed in accordance with current licensed procedures. Low-level radioactive waste would continue to be sent offsite for disposal at an NRC-licensed facility or incinerated onsite. The No-Action Alternative could result in short-term impacts. Decommissioning activities could result in increased quantities of waste shipped offsite and treated and released onsite. These activities could result in a greater potential to exceed regulatory effluent limits, a potential for increased public and occupational exposures to radioactive material, and an increase in the probability for traffic accidents.

The Proposed Action is not expected to result in any significant radiological impacts to public and occupational health. Doses to the general public have been a small fraction of the annual limit in 10 CFR 20.1301 and occupational exposures are also below the annual limit in 10 CFR 20.1201. The long-term impacts of the No-Action Alternative would depend on the level of decontamination achieved at license termination, which in turn would depend on whether the site was released for restricted or unrestricted use. Additionally, activities associated with the No-Action Alternative would have to be conducted in a manner that would ensure public and occupational exposures remain below the applicable regulatory limits.

### 4.2.2 Accidents

10 CFR Part 70, Subpart H, promulgated in 2000 (65 FR 56211, September 18, 2000), requires fuel fabrication facilities to perform an Integrated Safety Analysis (ISA). An ISA is defined in 10 CFR 70.4 as “a systematic analysis to identify facility and external hazards and their potential for initiating accident sequences, the potential accident sequences, their likelihood and consequences, and the items relied on for safety.” Items relied on for safety are structures, systems, equipment, components, and activities of personnel that prevent potential accidents

that could exceed the performance requirements in 10 CFR 70.61. The performance requirements define high-consequence accidents and intermediate consequence accidents.

High-consequence accidents are defined in terms of (i) radiation dose to a worker, (ii) radiation dose to an individual located outside the controlled area, (iii) an intake of soluble uranium by an individual located outside the controlled area, or (iv) a chemical exposure to an individual. High-consequence events must be controlled by items relied on for safety such that the event is highly unlikely or its consequences are less than the defined high consequences.

Intermediate consequence accidents are defined in terms of (i) radiation dose to a worker, (ii) radiation dose to an individual located outside the controlled area, (iii) an environmental release, or (iv) a chemical exposure to an individual. Intermediate consequence events must be controlled by items relied on for safety such that the event is unlikely or its consequences are less than the defined intermediate consequences.

In accordance with 10 CFR 70.62(c), WEC performed an ISA for the CFFF and submitted the analysis to the NRC for review in October 2004. When completed, the NRC review will be documented in a separate safety evaluation report. The ISA Summary is not available for public review because it contains information that is related to the security of the CFFF. In the performance of the ISA, WEC identified only one accident sequence. This accident sequence was identified as having potential consequences meeting the environmental release criteria for an intermediate consequence accident. WEC provided items relied on for safety to control this accident sequence such that the consequences are unlikely to occur. NRC determined that the items relied on for safety are adequate to control the likelihood of the accident sequence and that the CFFF can be operated in compliance with the performance requirements of 10 CFR 70.61, which is adequate to control the environmental consequences of accidents to a level acceptable to NRC.

#### 4.3 Cumulative Impacts

The NRC staff has evaluated whether cumulative environmental effects could result from the incremental impacts of the SNM-1107 license renewal for the CFFF site when added to relevant past, present, or reasonably foreseeable future actions in the area. No significant cumulative effects were identified for the areas within the affected environments described. For example, the water usage for the Congaree River is less than 1 percent of the total water usage in the watershed (WEC, 2006a). CFFF is in compliance with relevant environmental standards and regulations, as well as NRC regulations related to radiation dose to the public and facility workers. Further, the facility utilizes an ALARA program, routine environmental and radiation monitoring, a radiation safety program, a chemical safety program, and an environmental protection program to minimize the associated direct, indirect, and cumulative effects. Finally, WEC also conducts program audits and self-assessments as a way to minimize adverse environmental effects.

#### 4.4 Monitoring

WEC monitors CFFF effluents and the environment in and around the site to evaluate potential health and environmental impacts and to monitor compliance with applicable regulations and mandates. Samples are collected from the air, surface water, groundwater, sediment, soil, vegetation, and fish. Collection frequency and action levels differ for the various sample types.

Responses to results that exceed action levels include resampling, investigation, corrective action, and notification of the responsible regulatory agency if required. A detailed description of the CFFF monitoring program is documented in the license application (WEC, 2005b). Environmental monitoring results for each sample type are presented in the environmental report and indicate that impacts are small (WEC, 2004).

Air samples are analyzed for nonradiological and radiological contaminants. Monitoring for radiological contaminants at the point of emission is performed continuously during production operations involving licensed materials, and samples are collected and analyzed daily. Nonradiological monitoring at the stacks is conducted for ammonia and fluoride. Air samples are continuously collected from the four environmental monitoring stations and undergo weekly radiological analyses.

Water samples are analyzed for nonradioactive and radioactive contaminants. Liquid effluent generated from the ADU fuel fabrication process is continuously monitored for radioactive contaminants and must meet initial treatment threshold values prior to transfer from the main fuel fabrication plant to the Advanced Waste Water Treatment Facility for further treatment. Other liquid effluents are sampled for radiological levels on a batch basis prior to leaving the main fuel fabrication plant. A continuous, proportional sample of liquid effluent released into the Congaree River is collected. A 30-day composite of this sample is analyzed for radioactivity at the point of discharge to the Congaree River.

As part of the CFFF environmental monitoring program, water samples from river water and other surface waters are collected quarterly and analyzed for radiological contaminants. In addition, groundwater samples are collected semi-annually and analyzed for radiological contaminants and several nonradiological parameters including ammonia and fluoride. As part of the CFFF Storm Water Pollution Prevention Plan, a monthly grab composite sample is collected at a designated road storm drain location and analyzed for nonradiological parameters including pH, fluoride, and ammonia.

Sediment, soil, vegetation, and fish samples are collected annually and undergo radiological analyses. Vegetation samples are also analyzed for fluoride levels.

## 5.0 AGENCIES AND PERSONS CONSULTED

The NRC staff consulted with other agencies regarding the Proposed Action in accordance with NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with the Office of Nuclear Material Safety and Safeguards Programs (NRC, 2003). These consultations are intended to ensure that the requirements of Section 106 of the National Historic Preservation Act and Section 7 of the Endangered Species Act are met and provide the designated state liaison agency the opportunity to comment on the Proposed Action.

### 5.1 South Carolina Department of Health and Environmental Control

On November 14, 2006, B.J. Davis of the NRC sent a letter (Davis, 2006a) that contained a copy of the draft environmental assessment for this proposed action to the South Carolina Department of Health and Environmental Control for review and comment. In a letter from J. Peterson dated December 6, 2006 (Peterson, 2006), the Bureau of Radiological Health

expressed the view that the proposed action will have no significant impact on matters involving the use of radioactive material.

## 5.2 South Carolina Department of Archives and History

On November 14, 2006, B.J. Davis of the NRC sent a letter (Davis, 2006b) that contained a copy of the draft environmental assessment for this proposed action to the South Carolina Department of Archives and History for review and comment. The South Carolina Department of Archives and History provided its response in a letter from R. Dobrasko dated December 14, 2006 (Dobrasko, 2006). In this letter, it expressed the view that the proposed action will not affect properties included in or eligible for inclusion in the National Register of Historic Places. The South Carolina Department of Archives and History did provide one comment, which is documented in this environmental assessment along with the NRC staff response:

Comment: The potential impacts to archeological resources from future expansion or ground disturbance in previously undisturbed areas should be considered.

Response: Westinghouse is currently required by 10 CFR Part 70 to notify the NRC of any future proposed ground disturbances if these disturbances would require a license amendment. If a license amendment were requested, the NRC would review its potential environmental impacts. Additionally, based on comments regarding this EA from the South Carolina Department of Archives and the Catawba Indian Nation, WEC is considering a Memorandum of Agreement to coordinate with these agencies when any ground disturbances are planned.

## 5.3 U.S. Fish and Wildlife Service

On November 14, 2006, B.J. Davis of the NRC sent a letter (Davis, 2006c) that contained a copy of the draft environmental assessment for this proposed action to the U.S. Fish and Wildlife Service for review and comment. In a letter from T. Hall dated December 15, 2006 (Hall, 2006), the Fish and Wildlife Service expressed the view that the proposed action is not likely to adversely affect resources under their jurisdiction.

## 5.4 Catawba Indian Nation

On November 15, 2006, B.J. Davis of the NRC sent a letter (Davis, 2006d) that contained a copy of portions of the draft environmental assessment for this proposed action to the Tribal Historic Preservation Office for review and comment. The portions of the environmental assessment transmitted included the historical and cultural resource sections within the description of the affected environment (Section 3.7) and the environmental impacts assessment (Section 4.1). The Catawba Indian Nation provided a response in two letters from W. Haire dated December 1, 2006 (Haire, 2006) and February 27, 2007 (Haire, 2007). The following discussion summarizes the comments and provides the NRC staff responses:

Comment: A land sale apparently went out of a Federal action status without notifying the Catawba Indian Nation, and they wish to be notified of any such future actions.

Response: The land sale in question was not a federal action and did not require the NRC to consult with the Catawba Indian Nation.

Comment: The Catawba feel that a Memorandum of Agreement should be developed stating that no new ground disturbances will be conducted without contacting them as part of a proper Section 106. The Catawba requested to review the entire environmental assessment, not just the portions initially provided by NRC in the November 15, 2006, letter (Davis, 2006d).

Response: NRC staff sent a copy of the entire environmental assessment to the Catawba Indian Nation on January 5, 2007.

Comment: The Catawba stated that their primary concern is ground disturbance in areas without previous archaeological testing. They added that unless new ground disturbance ever occurs, the Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites, or Native American archaeological sites within the boundaries of the facility.

Response: Westinghouse is currently required by 10 CFR Part 70 to notify the NRC of any future proposed ground disturbances if these disturbances would require a license amendment. If a license amendment were requested, the NRC would review its potential environmental impacts. Additionally, based on comments regarding this EA from the South Carolina Department of Archives and the Catawba Indian Nation, WEC is considering a Memorandum of Agreement to coordinate with these agencies when any ground disturbances are planned.

## 6.0 CONCLUSION

The NRC staff concludes that the renewal of license SNM-1107 involving the continued operation of the CFFF site near Columbia will not result in a significant impact to the environment. The facility already exists, and no substantial changes to the facility or its operation are associated with the license renewal. The Proposed Action can be considered a continuation of impacts and was evaluated based on impacts from past operations. Gaseous emissions and liquid effluents are within regulatory limits for nonradiological and radiological components. Public and occupation radiological dose exposures are below 10 CFR Part 20 regulatory limits.

The environmental impacts of the Proposed Action have been evaluated in accordance with the requirements presented in 10 CFR Part 51. The NRC staff has determined that the Proposed Action would not have a significant impact on the human environment. According to NRC policy, actions without significant environmental impacts normally do not need to consider whether the action will have disproportionately high and adverse impacts on certain populations (NRC, 2003). No environmental impact statement is warranted and a finding of no significant impact (FONSI) is appropriate in accordance with 10 CFR 51.31.

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